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Patent Application

February 6, 1975 Hideo SAITO

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Air sterilization and purification apparatus

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Commissioner of Japan Patent Office:

1. Title of the Invention:

2. Inventor:

Domicile:

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5. List of Appended Documents

(1) Specification

1 set

(2) Drawings

1 set 1 set

(4) Power of Attorney

1 set Method Examination

(5) Request for Examination

(3) Duplicate Copy of Application

1 set

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Specification

1. Name of the Invention: Air Sterilization and Purification Apparatus

2. Scope of Patent Claims

In an air purification apparatus that passes positively charged airborne dust between opposing electrodes, an air sterilization and purification apparatus wherein air is caused to pass through while inducing a separation phenomenon by switching the direction of flow of air that passes through the aforementioned opposing electrodes and modifying a cross section of the passage.

3. Detailed Description of the Invention

The invention of the present application is one that relates to an air sterilization and purification apparatus, and in a purification device that causes airborne dust particles to be absorbed by static electricity, relates to a device capable of raising dust removal effectiveness, and is intended to achieve an air sterilization and purification apparatus that, in particular, is made up of a combination of novel and ever simpler elements, is manufactured by a simple process with lower costs of production, and that, with excellent safety, is capable of achieving even better results in use.

Along with the development of heavy industry, air pollution from sources at each stage of the production process, nitrous oxide and sulfur dioxide emitted from transportation sources, and heavy metal particulates, have steadily increased. The widespread expansion of pollution has become an issue of serious concern to society, and various regulations have been proposed to prevent pollution, including preventing the generation of toxic materials as well as the strengthening of emissions standards. These approaches, however, cannot be considered adequate, and there are a growing number of people who suffer from lung cancer and other cancers as well as an increase in the number of people suffering from asthma. Air purifiers have become a common and indispensable part of life and are to be found installed in homes and sickrooms to prevent and/or treat these illnesses, and are used as prevention or treatment devices in the production stages of sanitary pharmaceuticals, foods, devices, and are also employed in the production of precision machinery.

A variety of devices have been suggested to cleanse the air by removing airborne toxic materials. Among those are air purifiers that use filter materials in air flow passageways to physically collect the dust, or electrical air purification devices such as dust removers that make use of static electricity or infrared rays to disinfect the air, or a combination of any of these approaches in order to remove toxic materials.

Among these, suggestions for conventional devices based on the aforementioned use of static electricity are known, including, for example, (a) an approach utilizing centrifugal force designed such that air, induced from an air inlet, passes through an ionization element while electrical voltage is applied to the inner and outer cylinders while the inner cylinder rotates, moving the air between the inner and outer cylinders, and (b) an approach where, in the above configuration, the outer circumference of an inner cylinder has inclined guide vanes provided in the axial direction along the outer circumference of the inner cylinder and rotational movement is applied to the air as it passes through between the inner and outer cylinders to make use of centrifugal force.

The above mentioned approaches have attempted combined dust collection by the use of electrostatic migration and centrifugal force, however, because high voltages with 11 KV in between the inner and outer cylinders, and as a result of rotating the induced air, a rectified electricity may be generated due to frictional resistance depending upon the air flow rate, and electric discharge sparks may occur between the dust particles that have collected onto the external cylinder, frequently causing risk of electrocution as well as the increased production of ozone and possible malfunction of the device.

In view of the above, research conducted by the inventors of the present application have overcome and eliminated the well known defects described above, and have perfected a device that is superior in terms of safety and that markedly increases the efficiency with which dust is adsorbed. The invention comprises a fan motor; an inner cylindrical electrode that has a

built-in high-voltage transformer, and that is connected to the positive side; a high voltage cap connected to the negative side; an external cylindrical electrode that is earthed; and a housing that has openings on both sides, and that is supported by a pedestal. On occasion that airborne dust that is guided into the unit through the upper inlet passes through an ionization section high-voltage cap that is connected on the negative side, a positive charge is applied to the dust, and it is guided into the electrostatic field between the grounded outer cylindrical electrode and the positive inner cylindrical electrode, and as a result of the electrostatic induction effect, airborne dust passing through is adsorbed onto the surface of the outer cylindrical electrode. Thus, the present invention is characterized by having opposing electrodes that have a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed curved surfaces on the inner cylinder and an outer cylinder provided with a plurality of parallel curved surfaces and a plurality of convex curved surfaces or recessed surfaces, wherein the convex curved surfaces or recessed surfaces of the inner cylinder and the convex surfaces or recessed surfaces of the outer cylinder alternate with each other. By creating an electrostatic field between these opposing cylinders, the direction of the flow of air passing through them can be alternated, and the flow passageway cross section can be altered so that the flow rate fluctuates, thereby creating a flow separation phenomenon. This causes the generation of a stagnant flow, a reverse flow, or a turbulent flow of air that contains dust. The intention here is to extend the duration of the effect of the electrostatic adsorption on the outer cylindrical electrode surface and to increase in the efficiency of dust removal. The next object of this invention is to provide a device with superior safety. Additionally, an object of the invention is to provide a simple and compact mechanism that can be made available at low cost and that can be placed easily in a variety of locations, as well as to provide a device that allows simple, easy, and safe cleaning of the panel upon which the dust has been adsorbed. Other objects and characteristics of the present invention can be understood. from the following explanation.

In Figs. 1 through 5, a housing acceptor cylinder (5) is supported on a stand (1) by means of a shaft (2) upon which a support board (4) consisting of insulating material and provided with exhaust windows (3); an external cylinder accepting cylinder (7) is mounted on the edge of the lower opening section of said housing; an exhaust windows (6') is arranged in the external cylinder barrel (7); and a fan motor (8) is internally installed in a motor cap (9). The fan motor (8) (for practical purposes, preferably with a maximum torque of 1040 ± 10%) is connected to a power source, and the motor cap (9) has a built-in high-voltage transformer (11) that is connected to a power source. An inner tube electrode (14) made of metal and provided with stepwise alternating vertical curved surfaces (12) and convex curved surfaces (13) is installed onto the positive side of the high-voltage transformer, and a rounded-head inner cap (16) made of insulating material and continuing the multiple outer cylinder support [illegible] (15), (15) is mounted in the top opening of this inner cylindrical electrode (14). A metallic high voltage cap (18) that is provided with a limit switch (17) is installed in this cap (16) and connected to the negative side of the high-voltage transformer and a metallic outer cylindrical electrode (22) provided with stepwise alternating vertical curved surfaces (20) and recessed curved surfaces (21) on the upper opening edge step section (19) of the outer cylinder acceptor (7). The vertical arced surfaces (20) and the recessed arced surfaces (21) are positioned so as to face the swelling arced surfaces (12) on the inner cylindrical electrode (14) and the vertical arced surfaces (12) on the inner cylindrical electrode (14) with each other, respectively. The external cylindrical electrode (22) faces the inner cylindrical electrode (14). According to FIG. 1, an air inlet window (23) is arranged in the upper opening of the external cylindrical electrode (22), and a retainer plate (25) made of insulating material is provided on the bottom limit switch retainer element (24). Next,

the housing (27) is installed on the upper opening of the outer perimeter section (26) of the housing acceptor cylinder (5), which is installed on the support board (4). A head section retaining cylinder (28) is installed at the top section of this opening, and an air inlet window (29) is provided in this upper opening and a connector board (31) made of insulating material and provided with dust-proof mesh/screen (30) that is connected by means of bolts (32) to the retainer plate (25), air inlet windows (29), and air inlet windows (23), and is configured so that air passes between the inner and outer electrodes, the exhaust windows (6), and the exhaust windows (3), and is circulated to the outside when the fan motor (8) is operating.

At this time, when the high voltage transformer (11) and power source are connected by a switch, which is separately arranged (in practical terms, an input voltage of 100 V AC and output voltage of 7 KV DC are preferable) the airborne dust that is introduced [into the unit] is positively charged in the vicinity of the transformer (11), by the inner cylindrical electrode (14) that has been connected to the positive side by means of the electrostatic induction between the inner and outer electrodes, and is migrated to the external cylindrical electrodes (22) and clung to its walls.

Here, the direction of the air flow that is passing through the convex curved surfaces (12) and vertical curved surfaces (13) provided on the inner cylindrical electrode (14) is switched by the vertical curved surfaces (20) and recessed curved surfaces (21) provided on the outer cylindrical electrodes (22), and as a result of the change in the cross section layer between these electrodes, the spacing between the vertical curved surfaces (12), (20) of both electrodes should be approximately 20 mm; the spacing between the vertical curved surfaces (21) on the outer cylindrical electrodes (22) and the convex surfaces (13) on the inner cylindrical electrodes (14) should be approximately 16 mm; and the spacing between the recessed curved surfaces (21) on the outer cylindrical electrodes (22) and the vertical curved surfaces (12) on the inner cylindrical electrode (14) should be approximately 25 mm, for practical purposes. The recessed curved surfaces (21) should be 5 mm in diameter, while the convex curved surfaces (13) should be 4 mm in diameter. There is a change in flow rate, and the separation phenomenon is augmented. As a result, the dust-bearing air flow stagnates, reverses or becomes turbulent, thereby extending the duration for electrostatic adsorption and increasing dust collection efficiency (Fig. 6).

In the cross sectional configuration of the above mentioned both electrodes described above, in another embodiment, the convex curved surfaces (13) of the inner cylindrical electrodes (14) could have a gentle linear flow [illegible] convex curved surfaces (13) on the upstream side to intensify the switching of the direction of flow and the change in the flow passageway cross section, making it that much easier for the separation phenomenon to occur, forming lead (33) between the convex curved surfaces (13), (13) for a configuration that augments electrostatic induction. (Fig. 7)

Moreover, as a separate embodiment, convex curved surfaces (34) with gentle flow lines are formed on the upstream side of the outer cylindrical electrodes (22), and both flow line convex curved surfaces (34) and flow line convex curved surfaces (35) are positioned so they oppose one another, thereby intensifying the switching of the direction of flow and the change in the flow passageway cross section, extending the duration in which adsorption occurs due to stagnation, reverse flow, and turbulent flow of the dust-containing air (Fig. 8).

With regard to removal of dust clung onto the surfaces of the outer cylindrical electrodes, the power to electrode (22) is removed along with the retainer plate (25) by removing the connector board (31) and by pulling up and removing the head section retaining cylinder (28) and the housing (27), and after cleaning these, it is easy to restore them to their original state and join together. At this time, the retainer element (24) of the retainer plate (25) is separated from the limit switch

(17), thereby breaking off the flow of current between the high-voltage transformer (11) and the power source, so that there is no risk of electrocution.

As configured above, the present invention extends the duration of the cling effect on the outer cylindrical electrode by means of electrostatic induction of the dust-carrying air that passes between the electrodes, thereby increasing the efficiency of dust removal and reducing mold spores and yeast fungus.

Moreover, this is a particularly safe device since there is no danger that frictional force and resulting rectified electricity will be generated as a result of centrifugal force as the air passes through the unit, and the risk of malfunction due to sparking electric discharge between the adsorbed dust particles resulting in electrocution or explosion can be prevented, and the generation of ozone can be suppressed.

Also, given the device's simple and compact configuration, it can be manufactured less expensively, and it is also easy to move.

4. Brief Description of the Drawings

Figure 1 is a front view. Figure 2 is a plan view. Figure 3 is a view of the bottom surface. Figure 4 is a cross-sectional view along the A-A line in Figure 1. Figure 5 is a cross-sectional view along the B-B line in Figure 1. Figure 6 is an enlarged view of the area indicated by the letter E in Figure 4. Figure 7 is an enlarged flow line cross section diagram of another embodiment. Figure 8 is an enlarged flow line cross section diagram of yet another embodiment.

Applicant: Kyowa Seiko, Ltd. Agent: Hiraki MIURA [seal]



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7、 特許日本の単位

高ので存在以上られた存在中の人人に人士。可 対する代析的を結婚をせつようにした主は女子生 気にかいて、上記別のするで変質を選進する原式 の氏みがはたはれるせ、外の故称の研習が支援を をせることにおつて、別様項表を対応せるから 体を持ちゃしめるようにしたとともをなくする交 気候或性が必要。

2、有明日讲解水武有

本語の無限性、空気候質療命與技術はし、果皮甲のふんじんを背壁気により異質をしめる意動成態にかれて、その物理項型を付けるととのできる解析に関し、もくに関係で一層風料を供給の知合からまり、再半年生物とよりないを変するべき、カンの心臓に行れ、よりまい使用が異を得るどとのできるに実践関係的会式を持んとするものである。

MOREROMAKKU, CHAMREKE,

9 日本国特许尔 - 公開特許公報

登拾開昭 51-9007年 登公開日 昭51 (1976) 8. 6 ②壮斯昭 チローノルトロ 登出駅日 昭10. (1975) 2. 6 資本請求 者 (全5)

त्रेग्री दि

包日本分類 7- Cfy

DIALCIA

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そとで、出来中の容が物質を確定して対象化のための数式が関本型減され、 でのかくつがは登場の通過を対象を対した。 場面を対象がいたが成功 に は は で が は で が は で が は で が は で が は で が は で が は で が は で が は で が は で が は で が は で か と で

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かせからによって可容的式を放火せんとする点式 おさぜれている。

血田の矢根は、首相気の成刻力を発心力をの合成製品作品で出った。のである水、温力の列列目間に11天マの河田町を得可し、おり四個を近日をその母系、生水の成別によっては原序が代形とってを成成せを生じ、外別に成母されたよんじんよの何に大利以及を止じ、しばしばばせった人がある。、スナソンの何生なを別大しオソン夫を尽め前代上記しくさん、又しばしば此四七生かることので同時化が田田でもつ次

· 政权者指数国际中华军事的内部政府部上《规划·

מ לדו מפ-וכנו מון

上四天女子。《女女科英母女母女の伊米上母女 知如我帮权工事实力を思维的效心、证券民会由会 代表れ、ふんじんら見る共和をモーゼスやるととの でもるのはも気点したもので、ファンモートル。 高肥トランスを対象し毛の質に無視した四枚写成 我の何代が非した双匠・ヤップ、司名したお母 可在中下以处别的证明的每年产品与W.X.不可容标准心。 テサングから考虑され、上万人日から年入される . 昆虫=-〇三人なんお、久の何だ口信をれた何思? イソアの京都部を選出する際。草の実質を与える 九、至风省北大外首家市上京の台北州村七九六月 質な無視の容易なだなかれ、不可能を決定だよつ ておおすりでは中やかいのかがまればなどに見な せしかず異似を名するもので、したべつては有別 O 帮政化上步、对内宁各定居民、教训O平行或谓 と収載の個内は留文収得商品環を共える物料と、 就用但又不好对走完。その行情の常但就是又吃效 海狗居之。外势の四昧灭症又以命昭展而之无死定。

ジンプル可以の下方面の製品製作、方式な (で) 七 在对北美四极回亡由记忆大州村只好阳之就也。七 の上方事にファンセートルロを月刊した前以大公 あらえるタートルデナップ付をおおし、ファンセ ニトへ付く天村のに伏杖ストルブニョくを大えず ・ゴボヌスしい」を出口におくするととかまか、お 唯一人大十七岁了的上夜河都将长龙城长都的 卜办 本部トラレニ (AI) を行写し、最初に異変異数 (BI) と早日共享 (20) 七七段終終长天軍に乗りたかべの 万角電板 (54) 七月起トランネの玉の南のの外して - 教育學 - 成百年代 - 040 美子 美 四市 。 4 市 市 とし双翼の外側文集製 CDL CDS そだ成し大乗 G.米 **帯大らなる月質キャップ(14)を展示して、似モナ** コスim に りく ストペルス (四々ガダし大会点 ロ其点ぐちップ 切しをおすい、 当年トランスの丸 の何に四個女工ととか。3.0cm 可見作機公共日の上 双种和四种类似。即以《水河南部种类黄河(四) 左供名献者 (D) と主政治的民义卫民党扩大企品(D) 八男式成 (10) を無めして、その会民共享 (4) おけ 神滅區 (24) 中國和英國 [22] 克辛尔克克尔巴西斯斯斯 798-

· 我们在这样的 (2010 中央规范系 (20) F 医下丛 (20) A ナモとうにを見かめして、おかな気 (34) と別所で 七て祭ぶし大生、その上が月日本に乗ぶ金 850/を みた。下貝をリミフトスインテの罪え無情 (á) モ ひゃてるらせキザックマのかと又 (2) を思想し、 女に可能安全項目の知りしたハナランクの可憐の 。 上发现四根共用第四回(四)大一ナチング(D) 电复电 し、その上才は口名に可以がえな(8)を収点した 中,子口下点的现在分词 (10) 市市公司 (10) 中国的中国的 羅朝 (20) 电容例包表给作家保中与实品层积度 (23) をがせし、ボールト DDI を含むてが人 W(66) と話 好し、ひかりだもらしか、ファンエートル付きか 今の歌、天気は異似之(四) かとび行え来 (四) の果 以我 (向) 私工以時 (四) 上》、 22、 外國 华國國 七漢 法心心 养太祖 (时),对何后故心外国代前战士志贺 なとする.

その数、本化トランス (33) (専用物には、入力 製匠が、 0、 1 6 6 7、 解力収収 2 6 6 7 X Y マポス U W 2 1 と常果とを肝に使けたスイナテ による地域であば、ガスボルネジスやのエんじん

上記其他名の成果が大かって、何の地を行た 1-で、だって、100 05 申其首 1150 の上級 肉を成 かたれば観点数 (200)としまれずれののはおヤンが、 を取べませの吹れを欠なし、対象を太て一手がみ、 化するとともにならに、放果自其首は (23人(23) に できるともにならに、放果自其首は (23人(23) に できるともになられて対な言葉を含まする都含とす。 るとともできる。 (45 7 #) **

可与状义。其四类流列上して、其四项数(20) 化一、上层有化土、人工业业企用电影有效面(20) 化成分一、即对电影化学在两代中的下极力电视器即是其可(20) 化聚苯化、丙烷酸即是其可(20) 化聚苯化、 化聚化分配 化种同合金。用用白牙用的液。用电影被吸引发化电影。也就有电影,实现但其色传统。这是,那些在化工人是有作用的现在是多种关于工程。

東に、外質を運用に見まざれた本人で人の飲み に思わては、対面は自由(01) もまり思し、以前行 上質(01) シンドッグッド(01) 七列上げて成当点 した上心がみで(20) シミミに代明性症(00) を到ま 次を対析したほご の外に立しておなするでとかる (10) 氏統計省化元の数据に提出される。 (10) 氏統計省化元の数据にするとは、 (14) 内にコーング (23) のの間にからてはの間には (14) 内にコーング (23) のの間にからてはないによりに (15) に統計省化元の数据に提出される。

との前、月間電視(DA)に乗り大規模を下 (20) b 医复发医白叶合金、外口有关(三) 化量分元的复数 M (mo) と日本英年 [22] とだよって、足及の沿基ナ 和智符の子,, 口水る防火火力的現象的間の開発品 其中母母母(刘昭仁民共興成長中央民黨型 UPL。 [30] 中国国民共享《汉、共同党政(以) 中央民民國 (23) 上月前世紀-日本の祖祖祖(121) 上の神経改善。 工 4 端,从内 4 届 (101) 0 四 角 其 河 (121) 之 河 河 宝 岩 CMの最終異異 (IM)との異様をおまる元と。ナモと b、日子の田林其家 (m) 张本汽车、甲田共富 (m) はくろうとするにとかはてしい。 1 ロボボによつ て長男女女員し、女九の弟及以及七時天ナムの芸 上京》。在北京上の七台政府公司在長の伊安、江 化汉以此前世纪古家出古古外共写在河口 甘菜食酱 作点時間の減疫が増せられた気が返せ返げしゅる 母院巨士工。《兴·林》

のかて選集器単元を示。 こうはは天東 (28) のがえ 東京 (34) 女子とアンズイッグ (34) を収益し、写版 トフレベ (33) と写明との意思をポコので、成写の" アでれた公司を知る

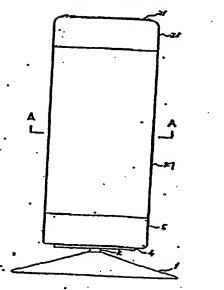
本事の成明化。 上記の表示によるので、 円式成門を通過する言葉是成本者を再本によって外異なる個に数例が提供するので、 その取屈が不を集びよったの内が以下、 終点はその女子をおけることができる。

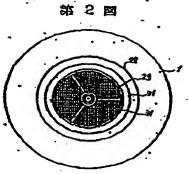
又、強減中の型はは、液心力が化とつて無形式 我们とる可能を見の発血のかぞれはなく。とつて 果実でれた上心じんとの異で火を放電を超過する 成は何いては最近年の現在を単位に対点するとと がする。又はアンの再出を使用するとともできる 供を住民党れた保健である。

多名民族與治療學小學不多名の不與外女工也と エト共外公司を表示とは古古古の中のおおても あ。

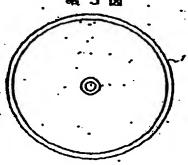
4、超貨の信息出版。

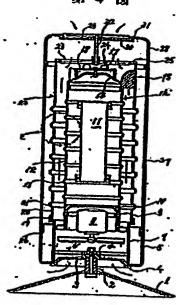
张文明环系统统,张文和标志规模。 建口的存储



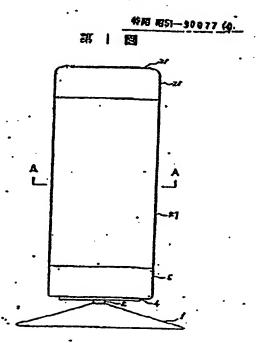


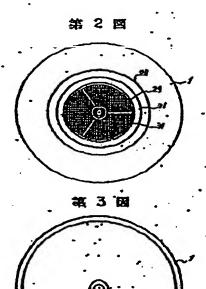
威 3 海

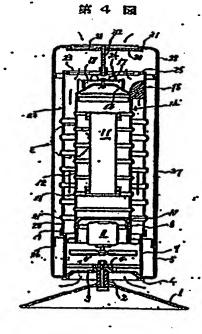




海原、河・日は河上の人一人地下かける政府財団 、河・河は内は一当前でかける政府関河、東日道 社存を選択がける成大財政民公司、東マ男女会 (で) 実立例にかける内板大関政民政司、ホリ盟は可供の に対の天母のでかける河域大勝政会政治である。

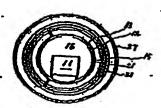






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